

MAY 26 1926

DEPARTMENT OF COMMERCE

TECHNICAL NEWS BULLETIN OF THE BUREAU OF STANDARDS

Subscription, 25 cents a year. Address "Superintendent of Documents,
Washington, D. C."

Washington, May, 1926—No. 109

MEETING OF AMERICAN PHYSICAL SOCIETY

The one hundred and thirty-ninth regular meeting of the American Physical Society was held at the bureau on April 23 and 24. The attendance numbered about 270, and 87 papers were presented covering almost every phase of the "new physics," such as atomic structure, X rays, spectroscopy, and radio.

Prof. Dayton C. Miller, of the Case School of Applied Science, and president of the American Physical Society, presented the results of 101 sets of observations involving 34,000 readings made last February at Mount Wilson in connection with his investigation to determine whether there is a drift of the ether relative to the earth. Professor Miller's work shows that there is a relative motion of the earth and the ether of 10 kilometers per second, the apparent apex of the earth's motion being a point in space having the right ascension of 246° and a north declination of 68° .

Several papers were presented by members of the bureau's staff, including subjects on electrical measurements, establishment of standards of radio-frequency, fading of radio signals, effect of amplitude on the frequency of a tuning fork, pressure distribution over airfoils at high speeds, and compensation of altimeters and altographs for air temperature.

In order to make it possible to present a larger number of papers before the meeting, provision was made for holding two sessions simultaneously in different buildings, loud-speaker installations being provided so that persons in attendance could hear either program without

going from one building to the other. This double or reciprocal use of loud-speakers for holding overflow meetings is rather unusual and was first employed by the bureau at the Physical Society meeting last year.

The system employs a microphone in the lecture room of each building, a line with amplifiers to the second building, and a loud-speaker installed in a room in the second building, adjacent to the lecture room in which the second program is going on. The bureau was able, with the assistance of the Bell Telephone Laboratories (Inc.), to install and operate this system without the design of any new apparatus, standard equipment produced by the large electrical companies being used throughout.

A dinner was held on the evening of April 23 at which more than 200 were present, the principal speakers being Dr. S. W. Stratton, president of Massachusetts Institute of Technology, and Dr. M. Q. Pupin.

VISIT OF INTERNATIONAL ELECTRO-TECHNICAL COMMISSION

For the first time since its formation the International Electrotechnical Commission met last month in the United States. The regular business sessions were held in New York, after which the foreign delegates made a tour of the northeastern section of the country. Saturday, April 24, was spent in Washington, and on that day about 90 delegates, representing many European countries, Canada, Japan, and Chile, took luncheon at the Bureau of Standards and inspected the laboratories in the

afternoon. Such a visit is a most effective way of furthering international cooperation in the electrical field.

The International Electrotechnical Commission was formed as the result of discussions at the International Electrical Congress held in St. Louis in 1904. The sessions in New York covered a wide range of subjects extending from steam and water turbogenerators to the bases and sockets for electric lamps. International standardization in electrical matters is being brought about through the efforts of this organization in cooperation with the various national standardizing institutions.

NINETEENTH NATIONAL CONFERENCE ON WEIGHTS AND MEASURES

The Nineteenth National Conference on Weights and Measures will be held at the Bureau of Standards on May 25 to 28, inclusive. Invitations have been sent to the governors of the different States, requesting them to name delegates to the conference, and it is expected that there will be a large and representative attendance.

Many important questions will come up for discussion, including some which have been carried over from the last conference and which have received the consideration of special committees during the year. Among these are the question of specifications and tolerances for taximeters, basis for the sale of ice cream, mandatory net-content marking of all commodities in package form, and the measurement of petroleum products.

POSSIBLE DISCONTINUANCE OF RADIO SIGNAL TRANSMISSIONS OF STANDARD FREQUENCY

Since March, 1923, the Bureau of Standards has been transmitting, twice a month, radio signals of definitely announced frequencies for use by the public in standardizing frequency meters (wave meters) and transmitting and receiving apparatus. The signals are transmitted from the bureau station, WWV, Washington, D. C., and from station 6XBM, Stanford University, California.

Since other means of freely disseminating the bureau's standards of frequency

have become increasingly available, the bureau is considering the termination of the standard-frequency transmissions. The other means referred to are the lists of standard-frequency stations regularly published in the Radio Service Bulletin, published by the Bureau of Navigation, the use of piezo oscillators, and the wide availability of reliable standards and testing service from a number of laboratories that do commercial testing of frequency meters. None of these means were available when the standard-frequency transmissions were inaugurated.

The standard-frequency transmission schedules already announced, extending through June, will be carried out as published. The Bureau of Standards is now announcing the possible termination of the service after that date in order that persons who depend upon the service in any special way may inform the bureau of any objection to its termination.

The bureau will be especially glad to hear from persons in the western part of the United States, who have been utilizing the signals from Stanford University, since the listing of standard-frequency stations on the west coast has not yet been begun. Any letters on this subject should be addressed to Bureau of Standards, Department of Commerce, Washington, D. C.

COMPRESSIVE STRENGTH AND DEFOR- MATION OF STRUCTURAL STEEL AND CAST IRON AT TEMPERATURES UP TO 950° C.

A paper, prepared for presentation before the June, 1926, meeting of the American Society for Testing Materials, presents the results of about 200 tests conducted at the bureau on typical rolled-steel shapes and one hollow round cast-iron shape. The specimens are heated within a horizontal furnace with end compensating heating coils to neutralize end losses, the temperature uniformity over a 6-inch gauge length being generally within a few degrees centigrade. Loads are applied by means of a hydraulic piston with suitable calibrated load-indicating devices. The deformations are

measured over a 6-inch gauge length, using the suspended wire method. The tests have been confined to structural steels of the soft and medium grades, and to gray cast iron.

For symmetrical structural steel sections the results give a considerable rise in strength over the cold strength in the region near 250° C. (482° F.). Beyond 400° to 500° C., depending on the section shape and metal thickness, there is a decided decrease in strength, failure under working loads ordinarily applied (from 16,000 to 8,000 lbs./in.²) being in the region of 550° to 750° C. ($1,022^{\circ}$ to $1,382^{\circ}$ F.). In most of the tests the specimen is heated up to a given temperature with measurement of expansion under no load and then loaded to failure. In some of the tests a constant load is applied at the beginning of the test and failure obtained by increasing the temperature with the specimen under constant load. These gave failures at lower temperatures for given loads by a few degrees centigrade, due to the longer time under load.

A study of the effect of duration of loading on ultimate strength at various temperatures is included, the durations from 15 minutes to 4 hours being within the limits of interest from the standpoint of fire resistance of building members. These gave failures or deformations equivalent to failure in large building members at loads as low as one-half of those required to cause failure of the $10\frac{1}{2}$ -inch specimens for short-time application of load. These tests were confined to the temperature range 595° to 705° C. ($1,103^{\circ}$ to $1,301^{\circ}$ F.).

There is also included a brief series on effect of length on strength at temperatures near 600° C. ($1,112^{\circ}$ F.). Reducing the $10\frac{1}{2}$ -inch length by one-half increased the compressive strength 17 per cent, and by three-fourths, 22 per cent. The average results in terms of loads and temperatures required to cause failure in tests at constant load with light angles and channels ($10\frac{1}{2}$ inches long) were nearly the same as for columns 12 feet 8 inches long in the series of fire tests of building columns reported in

Bureau of Standards Technologic Paper No. 184.

The cast-iron specimens, $1\frac{1}{2}$ -inch outside diameter and $\frac{1}{2}$ -inch inside diameter, gave higher strengths at room temperature than any of the steel sections. With increase of temperature the strength decreased, being only a little above that of some of the steel sections at 500° C. (932° F.), and practically the same as for the steel sections giving the highest results, at 750° C. ($1,382^{\circ}$ F.).

A TEST OF A FULL-SIZED INDIANA LIMESTONE COLUMN

Recently an unusual and interesting test was made at the bureau on a full-sized Indiana limestone column. The stone had been designed and prepared for carrying with other columns a small portico of a building in Washington. A change was made in the design of the building, and as the columns were no longer required one was secured for testing. The top of the column was cut off just below the bottom of the lifter hole. The dimensions of the piece as ready for testing were: Height over all, 10 feet 2 $\frac{1}{2}$ inches; diameter at top, $13\frac{7}{16}$ inches; diameter at the middle, $14\frac{5}{8}$ inches. The test was made in the 10,000,000-pound compression machine, where, after bedding the specimen in plaster of Paris on both ends, a total load of 1,050,000 pounds was applied before failure occurred.

Using the area at midsection, the unit compressive stress was found to have been approximately 6,250 lbs./in.². Tests made of cylinders 2 inches in diameter by $2\frac{1}{2}$ inches high cut from a section of the lower part of the column just below the broken portion gave a unit stress of 5,820 lbs./in.² as the average result of nine of the small specimens. Both stress figures are quite close to the average stress obtainable from this grade of stone when tested with the bedding vertical as in this case. The lower strength obtained with the small cylinders cut from the column after it was broken may have been due to strain set up in the stone when stressed as a column.

The test is particularly interesting in that a relation was obtained between the

stress developed by a full-sized commercial piece and the usual small laboratory test specimens. In this case the column gave a slightly lower figure than had the small cylinders previously tested, but it may be noted that the value obtained from the test of the column was still approximately 10 times the figure usually employed in structural-design calculations.

ADHESION OF GYPSUM PLASTER TO VARIOUS BACKINGS

Specimen slabs of concrete, plastered with 1:3 sanded gypsum plaster and aged for one year to determine if a loss of adhesion could be noted, have been tested by the bureau. The slabs were stored in the laboratory, where they were subjected to the temperature and humidity changes corresponding to a partition wall or ceiling. Two specimens have been tested, the method being the same as that used with the seven-day-old specimens.¹ The specimens were placed in an Olsen testing machine, of 5,000 pounds capacity, with the backing clamped securely to the movable platform and the mechanical device connected to the stationary platform. A gradually increasing load was then applied until the plaster pulled free of the backing. The following results were obtained:

Kind of backing	Adhesion (after 1 year)	Factor of safety adhesion weight plaster	
		Lbs./in. ²	
Concrete (1:2:4) by volume	{ 14.8 16.7	350	400
Mean	15.8	375	

The adhesion of 1:3 sanded gypsum plaster to concrete (1:2:4 by volume) after aging seven days was found to be 15.6 lbs./in.². Therefore, the above results would indicate that the adhesion does not decrease with age, as has been

thought to be the case. However, it must be borne in mind that these specimens were not subjected to any great temperature or humidity changes, as might be found in most constructions. Neither were there any stresses or strains brought to bear on the concrete, as would undoubtedly be the case under practical conditions. In some instances, where the failure of the bond between gypsum plaster and concrete has occurred, the method of application of the plaster and concrete has been a contributing factor. In the case of the above specimens the concrete was thoroughly cleaned and moistened before the plaster was applied. The surface of the concrete was slightly rough and of coarse texture, and therefore no backing was necessary. The moistened surface prevented too much suction and did not rob the plaster of the water necessary for the chemical reaction which causes the gypsum to set and harden.

PROPERTIES OF POTTERS' FLINTS AND THEIR EFFECTS ON WHITE-WARE BODIES

The final report of this investigation is given in Bureau of Standards Technologic Paper No. 310, Properties of Potters' Flints and Their Effects in White-Ware Bodies. The report includes the chemical and mechanical analyses of 17 commercial flints and the results of physical tests on the flints themselves and on typical white-ware bodies containing them.

It was found that flints which are very finely ground tend to cause the bodies to "overfire" more readily than those bodies in which coarse-grained flint is used. This overfiring has a tendency to make the bodies less resistant to chipping and breaking. It was also shown that the so-called cryptocrystalline flint, or French flint, causes the bodies to withstand sudden temperature changes somewhat better in the range between 500° and 600° C. This would make the ware somewhat less liable to break in the kilns in which it is initially burned. On the other hand, the quartz flints, which are

¹"The adhesion of gypsum plaster to various backings," J. P. C. Peter, American Architect; Sept. 9, 1925.

entirely crystalline as compared with the cryptocrystalline which are partially amorphous, appear to make the bodies more resistant to cracking when subjected to sudden temperature changes below 200° C. This is of particular interest to the users of household china, since the ware may be subjected to sudden temperature changes below this temperature in domestic uses.

FLOTATION OF ENAMELS

Relationships have been established by the bureau between fineness of grinding, stage of grinding at which borax is added in the ball mill, and consistency of enamel slips. Consistency was measured by observing the rate of flow of the enamel slips through a capillary tube at a constant temperature and under known pressures. From this test a property of the slips known as yield value can be obtained. High yield value indicates ability of the slip to adhere in relatively thick coats to the metal base, making it possible to produce a uniform coating of enamel.

It has been shown that within practical limits yield value increases at an accelerated rate with time of grinding. Other experiments led to the conclusion that adding borax nearer the beginning of the grinding process causes a considerably lower yield value in the resulting slip. Fineness tests showed an increasing grain size corresponding to earlier additions of borax, thus confirming the previous conclusion concerning the effect of fineness on yield value and indicating that more efficient grinding can be obtained by adding the borax near the end of the grinding process. Already these results have proved of value in the manufacture of white ware.

DENTAL RESEARCH

A progress report on the dental research being carried on at this bureau has been completed covering the work for the year 1925. This report has been mailed to the Dental Cosmos for publication and distribution to the dental profession. The report will appear in an early issue of the above-named journal.

Data on casting shrinkages, melting changes, and compositions of alloys are given. Considerable data on plaster-silica investment compounds are included.

EXPANSIVITY EQUIPMENT

The number of requests received for blue prints of the bureau's precision expansivity equipment (announced in the March issue of the Technical News Bulletin) is proof of the demand for reliable data on expansion. It is felt that a further service can be rendered by supplying details of a less expensive equipment of slightly less accuracy and designed to admit specimens of varying lengths.

Apparatus is now being built which it is believed will meet the above requirements. The total cost should come below \$500. Approximately six months will be required to complete and test this apparatus, after which further announcement will be made.

UNITED STATES CURRENCY PAPER

The bureau is making a study of means for improving the wearing quality of United States paper currency. This work is being conducted in cooperation with the Treasury Department, the Bureau of Efficiency, and the present manufacturers, Crane & Co.

The life of a \$1 bill, which is the greater part of our paper currency, had been continually decreasing in past years until in 1924 it averaged six months. Formerly its life was around 20 months. The use of paper currency has increased threefold in the past 15 years. These conditions required the manufacture of over 1,000,000,000 new bills, weighing more than 1,200 tons, annually to replace the worn-out currency. The chief contributing factors to the decreasing life of the paper currency are, no doubt, its increasing rapidity of circulation and the increasing carelessness in the handling of it. These conditions may possibly be partly accounted for by the decreasing purchasing value of the bills. The cost of the annual replacement had mounted to \$4,000,000. The Treasury Department was concerned not only over this huge

outlay but was faced with the necessity of making costly additions to its paper-currency printing plant—the Bureau of Engraving and Printing—as its production facilities were becoming overtaxed.

The early studies made in 1924 indicated that a part of the weakness of the bills was due to the all-linen fiber composition. An admixture of 25 per cent of cotton fiber was recommended, as it was thought this softer fiber would give greater folding endurance. The change was effected with beneficial results. These studies indicated that extensive technologic research should be made on both the paper manufacturing processes and the printing processes. Such a study was made possible through the cooperation of the Bureau of Efficiency, which provided the additional personnel required.

The paper-manufacturing processes are being studied on a semicommercial scale in the mill at the Bureau of Standards. These are essentially the same as used for high-grade rag-fiber bond papers. The materials used so far are those in present use commercially, although various proportions of the linen and cotton fibers have been experimented with. The present proportion of these fibers in commercial use (75 per cent linen and 25 per cent cotton) apparently gives the best results. Modification of the nature of the beating treatment had a marked influence on the strength of the paper. By brushing out the fibers well and leaving them long, paper of satisfactory printing quality and having at least double the strength of the paper in use was produced with no increase in cost of manufacture. Very gradual application of roll pressure in beating was found necessary to prevent cutting the fibers too short, and a low concentration of the beater stock proved of advantage in permitting rapid circulation of the stock with a consequent minimum of hydration. Crane & Co., who closely cooperated in this work, found no difficulty in applying these semicommercial results to commercial mill practice, and they are now supplying currency paper with this increased

strength. An important feature of this study is the trial printings of each experimental lot of paper by the Bureau of Engraving and Printing, as this, in addition to the strength tests made in the paper laboratory, is a critical test, protection against counterfeiting being dependent largely on the quality of the printing.

Another line of research being followed deals with the surface sizing of the printed bills. Such treatment gives increased life of the bills, as it protects them from surface abrasion, gives them better water resistance, and makes the printing more permanent. In the past animal glue alone was used for this purpose. It was found that increased resistance to wear is obtained by hardening the glue sizing with formaldehyde, and bills so treated have been put into circulation for a service trial. Other substances, such as nitrocelluloses, albumen, and varnishes, have been experimented with, but while they are satisfactory in respect to surface protection they make the bills brittle and add an undesirable gloss.

Service records of the paper currency are available so far for the old type of paper only. They show, however, that the average life of the bills has been increased to 10 months, an improvement of more than 50 per cent. This is probably due mainly to resumption of glue surface sizing by the Bureau of Engraving and Printing and the fiber modification mentioned. The 100 per cent increase in strength of the new type of paper now in use over the old type, together with the improved surface sizing, should result in further material increase in the life. It is believed that in addition to meeting the increased demand for paper currency with limited expenditures this work will be of value in the general technic of papermaking.

A STUDY OF CASE-LINING PAPERS

The Bureau of Foreign and Domestic Commerce publishes a manual entitled "Packing for Foreign Markets," which gives information to exporters on the

best methods of packing goods for overseas shipment. Most commodities are adversely affected by water. Therefore, it is necessary in lining export packing cases to use a highly waterproofed paper. The Bureau of Standards was requested by the Bureau of Foreign and Domestic Commerce to specify paper for this purpose, the specification to be included in the above manual. Various types of papers that might be suitable were therefore tested. The properties mainly considered were waterprooofness and strength.

A type of paper known as duplex asphalted kraft was found best to meet the severe requirements. This paper consists of two sheets of strong kraft wrapping paper cemented together with a layer of asphaltum as the waterproofing medium. Such paper has sufficient strength to withstand the many sudden shocks and strains incident to overseas transportation and is water resistant to an almost unbelievable extent.

Soon after the work was started it developed that the method of test commonly employed for determining the water resistance of wrapping papers was entirely inadequate and very misleading. This method consists in placing the sample under a water column and noting evidence of moisture passing through the paper by observation of its under surface, which is exposed to the air. Papers having comparatively slight water resistance, such as rosin-sized kraft wrapping papers, withstand this test indefinitely because the moisture evaporates as fast as it is transmitted through the paper without forming drops or other visible evidence of its presence. After considerable research it was found that transmitted moisture could be trapped and made visible by means of a ground-glass surface. When a box made of the paper under test is filled with water and set on the glass any moisture passing through the paper is held by the many interstices of the ground surface and is visible upon lifting the box. A piece of black paper placed under the ground glass makes the trapped moisture more easily visible. Duplex asphalted kraft paper showing no transmission of mois-

ture by this method within 24 hours is recommended for lining cases intended for overseas shipment.

This work is fully described in Technologic Paper No. 312, copies of which may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5 cents each. This paper is devoted entirely to the paper investigation and is not to be confused with the packing manual of the Bureau of Foreign and Domestic Commerce.

RAYON CONFERENCE

A group of rayon manufacturers and representatives of various textile associations, the members of which are using this fiber in the manufacture of their product, conferred with representatives of the bureau on April 21 for the purpose of outlining the research program on rayon, so that the bureau's work will center on the most important problems confronting the rayon industry.

The projects discussed were the effects of moisture on the physical and chemical properties; standard moisture regain; kind and percentage of oil to be used in manufacturing and its effect on the physical and chemical properties; uniformity and stability of the fiber; and such problems in the use of rayon as effect of cleaning, ironing, perspiration, light, etc.

Although all of the problems suggested deserve some study, obviously the bureau can not hope to undertake such a comprehensive program. The conference agreed that studies of the effect of moisture on the properties of rayon and the stability or resistance to aging would serve the greatest good at this time. It was stressed particularly that the proposed project should be planned to study not only what occurs but why it occurs, so that possible remedies may be found.

SOLE-LEATHER INVESTIGATION

The bureau published the results of an investigation to determine the comparative durability of chrome and vegetable tanned sole leathers in Technologic Paper No. 286. It was shown that sole leather

which had been tanned by means of chromium salts in some cases wore twice as long as the vegetable leather. The chrome leather possessed certain disadvantages, however, such as lack of firmness and water resistance, which would prevent its general acceptance as a soiling material. It was suggested that this difficulty might be overcome by retanning the chrome leather with vegetable tanning materials. This suggestion met with considerable demand on the part of the industry for an accurate measure of the comparative serviceability of chrome retanned and vegetable tanned leathers. Accordingly the bureau has started an investigation of this subject and has secured the cooperation of three tanners who will furnish the leather necessary for the conducting of approximately 500 service tests. Data will be secured on chrome leather lightly retanned so as to color the grain, on chrome leather of medium retannage so as to be thoroughly struck through with vegetable materials, and on chrome leather thoroughly retanned and partially filled with vegetable materials, which will show the extent by which the added wear resistance of the chrome tannage may be utilized in a retanned leather.

RECLAIMED RUBBER

In Technologic Paper No. 294 it was shown that when a part of the new rubber in the tread of a pneumatic tire is replaced by an equal quantity of reclaimed rubber the abrasive resistance of the tread is reduced.

The bureau's next step in the investigation, to accomplish the purpose as set forth in Technologic Paper No. 294, is to ascertain if better results may be obtained with a different proportionate amount of reclaimed rubber and with certain adjustments of the other ingredients.

LIST OF COMMERCIAL TESTING LABORATORIES

In recognition of the desirability under present conditions of independent commercial testing service and in anticipation

of a marked increase in the demand for such service in both domestic and export trade, the bureau is making as nearly complete and accurate as possible its list of laboratories throughout the country that are prepared to test various kinds of commodities to determine whether or not they comply with purchase specifications. In this list will be included the laboratories of universities and colleges that are equipped for doing commodity acceptance testing on either a purely commercial basis or for the purchasers of the States, municipalities, public institutions, or the schools themselves.

The existence of a thoroughly classified list of commercial testing laboratories, together with a list of other reliable "checking agencies," will have a number of beneficial effects in promoting the use of specifications, not the least important of which will be the inducement offered to the large number of purchasers who have hitherto hesitated to buy on specifications.

Heretofore purchasers not individually equipped to make their own acceptance tests have been reluctant to adopt the specification method of buying commodities because of the fixed belief that many manufacturers work off "seconds" on such customers. The knowledge that they can at any time, when they so desire, call upon testing laboratories to check the deliveries made to them on contracts based on specifications with which certificates have been issued by the manufacturers will induce a large number of such purchasers to take full advantage of the certification plan.

The outstanding fact in the specification situation at the present time is that a very great majority of the purchasers who should be using specifications are not doing so. It is to this great group of purchasers that the certification plan will prove most beneficial. If, in addition to obtaining copies of as good specifications as can be written at the present time, all purchasers are able to secure lists of firms willing to manufacture to these specifications and to certify to compliance therewith, and lists of testing

laboratories and checking agencies, many of these purchasers will readily adopt the specification method of buying. This is especially true of the purchasers of States and municipalities who are an-

ious to use specifications but have not thus far felt justified in doing so because of inability to determine whether or not the commodities comply with the specification requirements.

APRIL 1926, PUBLICATIONS

Additions to "Supplementary List of Publications of the Bureau of Standards"
(Beginning July 1, 1925)

Circulars

Ca82. Fire-clay brick. Their manufacture, properties, uses, and specifications. Price, 25 cents.

Handbooks

H6. Safety rules for the installation and maintenance of electrical supply stations. Price, 10 cents.

H7. Safety rules for the installation and maintenance of electric utilization equipment. Price, 15 cents.

Outside Publications

The Beta-ray spectrum of radium D. L. F. Curtiss; Physical Review, Vol. 27, p. 257; March, 1926.

Some comments on Swedish steel practice. B. Kjerrman; Transactions American Society for Steel Treating, p. 585; April 9, 1926.

Mass effect in quenching. H. J. French, O. S. Klopsch; Fuels and Furnaces, Vol. 4, p. 435; 1926.

The Bureau of Standards aids miscellaneous manufacturers. F. C. Brown; Trucks for Manufacturers, published by Graham Bros., Detroit.

Elastic ring for verification of Brinell hardness testing machines. S. N. Petrenko; Transactions American Society for Steel Treating, Vol. IX, No. 3, p. 420; March, 1926.

The identity of Isomaltose with Gentiobiose. Henry Berlin; Journal Ameri-

can Chemical Society, Vol. 48, p. 1107; 1926.

Research work at the Bureau of Standards on the establishing of Dextrose and Levulose industries. Frederick Bates; Facts About Sugar, vol. 21, p. 250, 1926. The Planter and Sugar Manufacturer, Vol. 76, p. 288, 1926; Sugar; Vol. 28, p. 167, 1926.

Excitation potentials of the spectra Argon II and Neon II. F. L. Mohler; Science, Vol. 43, p. 405; April 16, 1926.

Progress report of research work on the fire resistance of hollow load bearing wall tile. H. D. Foster; Proceedings eighth annual meeting of the Hollow Building Tile Association, p. 90; 1926. Fire prevention and fire protection for storage warehouses. N. D. Mitchell; Thirty-fifth annual report of the American Warehouse Men's Association, p. 445; 1925.

Progress in the measurement of motor fuel volatility. T. S. Sligh, jr.; Journal Society of Automotive Engineers; April, 1926.

Government purchases of lubricants on a quality basis. H. E. Dickison; Bulletin American Petroleum Institute; April, 1926.

Effects of fuel and engine design on starting. S. W. Sparrow; Bulletin American Petroleum Institute; April, 1926.

"

7;

d-

ose

ck

ar,

ar

6;

Ar-

er;

26.

the

ng

ngs

ow

26.

for

ell;

er-

p.

tor

ur-

ers;

on

ful-

ite;

on

etin

ril,